

## A Situation Semantic Approach to Argument-roles in Japanese

Masahito Kawamori  
Information Science Laboratory  
NTT Basic Research Labs  
`kawamori%atom.ntt.jp@relay.cs.net`

### Abstract

An approach to a semantic theory of thematic roles in Japanese is described. This theory is applied to the analyses of the Japanese donatory verbs and post-nominal particles. Specific definitions of these items are developed, and the semantic characterization, with some syntactic consideration, of a small fragment of sentences containing these are given. It is seen that the theory presented here captures some essential features of these verbs and particles.

### 1 Introduction

The purpose of this paper is two-fold: I would like to characterize the semantic structures of Japanese post-nominal particles such as *kara* and *ni*; I also want to give a semantical account of the so-called *donatory verbs* of Japanese, like *yarū*, *morau*, and *kureru*. More specifically, my business here is the analysis of the sentences in the following fragment:

- (1) **Hanako-ga Taro-ni tegami-wo yat-ta**  
hanako-SUBJ taro- to letter-OBJ give-PAST  
Hanako gave Taro a letter
- (2) **Taro-ga Hanako-kara tegami-wo morat-ta**  
taro-SUBJ hanako- from letter-OBJ be given-PAST  
Taro received a letter from Hanako
- (3) **Hanako-ga Taro-ni tegami-wo kureta**  
Hanako-SUBJ Taro- to letter-OBJ give-PAST  
Hanako gave (our) Taro a letter

From the semantical point of view, these two topics constitute part of the linguistic aspects that are the two sides of one and the same coin; the semantical function of a post-nominal particle is determined by the semantic properties of a verb with which it appears, while the semantics of a verb is often characterized by the way the event that is denoted by the verb involves the entities represented by those particles.

Despite their importance in the general theory of the Japanese language, however, these two topics have not, as far as I know, received a full semantic account in terms of rigorous model-theoretical semantics so far. One reason for this general absence of semantical account for these important aspects of the Japanese language is that the account typically requires a way to classify the roles played by objects in events and situations, which the conventional model-theoretical semantics often lacked. The other reason is that the Japanese donatory verbs essentially involve indexicality, which the many conventional theories failed to take into account. This paper addresses itself to these problems within the framework of Situation Semantics.

The next section describes the overall framework of Situation Semantics, such a part of it as is necessary for the analysis of our fragment. My starting point is the paper written by Richard Larson 1988 on implicit arguments in English. In the third section I develop a theory of the Japanese donatory verbs and post-nominals, using the apparatus introduced in the first section. I modify and extend Larson's theory to account for the special features of Japanese. The sentences in the fragment are given syntax-directed translations. The next to the last subsection discusses the interesting topic about the role played by "point of view" in the semantics of donatory verbs, while the last subsection gives a conjecture about the general semantic properties of the donatory verbs.

## 2 Framework

In the discussion that follows I shall adopt, like Larson 1988, the version of Situation Semantics as presented in Barwise and Perry 1983. I shall give below a brief overview of whatever portion of the theory is necessary for our subsequent discussion.

### 2.1 Situation

The first and foremost of the theoretical concepts in Situation Semantics is the concept of situation. A situation in Situation Semantics has at least two meanings; In one sense it is what is part of the Reality; in the other it is an abstract classificatory device constructed from set-theoretical entities that is used to talk about the situation in the first sense. In what follows I shall not make a strict distinction between the two senses of situation but refer ambiguously to either of these. In other words, when I speak of a situation it could be either an abstract



Given the event-type  $E(a, l)$ , we think of a function that assigns to (some of) the indeterminates in  $E(a, l)$  individuals and locations. Such a function is called an *anchor* (Barwise and Perry 1983:72–73). If we set  $f$  to be such that  $f(a) = \text{“wittgenstein”}$  and  $f(l) = \text{“11 am., April 3, 1914,”}$  then the event-type obtained by replacing each indeterminate in  $E(a, l)$  by the value of  $f$ , denoted by  $E[f]$ , is actually the same as  $e'$  above. Similarly, given the anchor  $g$  such that  $g(a) = \text{“socrates”}$  and  $g(l) = \text{“4pm., June 16, 345 B.C.”}$ ,  $E[g]$  is the same as  $e$  above. We can state this fact as:<sup>2</sup>

$E[g]$  is part of  $e$ , and  $E[f]$  is part of  $e'$

This naturally gives rise to the formal definition of an event-type:

- (4) A course of event  $e$  is of type  $E$  (in symbols,  $e : E$ ), if there exists an anchor  $f$  such that  $E[f]$  is part of  $e$ .

We call an event-type in which exactly one individual and exactly one location are abstracted over a *complex property* (Barwise and Perry 1983:76). The event-type  $E$  that we have discussed above is an example of a complex property: the complex property of being a hungry philosopher.

## 2.3 Constraints

An important aspect of situations is that they can have various sorts of interconnected relations. A special kind of such relations is the one in which a situation constrains another in such a way that they can contain information about one another. This kind of relation is called the *involve* relation (Barwise and Perry 1983:94). For example, the information contained in an event in which John touches Mary is always part of the information that is contained in an event in which John kisses Mary; whenever an event in which John kisses Mary obtains at a certain time-location then it cannot be otherwise than that at the same time-location an event in which John touches Mary obtains also. In this sense the event of John's kissing Mary at a certain time-location *involves* an event of John's touching Mary at that time-location. In the similar vein, if one utters the sentence John kisses Mary then, for it to be true, there must be an event, at some time-location or other, in which it is certainly the case that John kisses Mary. Consequently, when one utters the sentence John kisses Mary then the sentence John touches Mary may itself be said to be involved. This relation among utterances and events can be graphically depicted as follows:

John kisses Mary.	→	in $e$ : kiss, john, mary; yes.
↓		↓
John touches Mary.	→	in $e'$ : touch, john, mary; yes.

Not only does the particular event of John's kissing Mary involve John's touching Mary, any event of the former type involves that of the latter type. We say then that there is a *constraint* between these two event-types. Namely:

at  $l_u$ : involves,  $E$ ,  $E'$ ; yes.

where

$E :=$  at  $l$ : kiss,  $a$ ,  $b$ ; yes

$E' :=$  at  $l$ : touch,  $a$ ,  $b$ ; yes

This notion of constraint is what we take advantage of when we characterize the meanings of donatory verbs and post-nominal particles. What is related to an event by a constraint is called a meaningful option of that event (Barwise and Perry, 1983:104). More specifically, we define it as follows. Let  $C$  be the constraint: at  $l_u$ : involves,  $E, S$ ; yes. Then:

1. A course of event  $e_0$  is *meaningful with respect to  $C$*  if  $e_0 : E$ ;
2. If  $e_0$  is meaningful with respect to  $C$  then  $e_1$  is a *meaningful option from  $e_0$*  with respect to  $C$  (symbolically<sup>3</sup>  $e_0 \Rightarrow_C e_1$ ) if for all anchors  $f$ ,  $e_0 : E[f]$  implies  $e_1 : S[f]$ .

## 2.4 Thematic situation types

Gruber 1965 and Jackendoff 1983, among others, introduced the concept of *abstract predicates* that decompose the meaning of a lexical item into more primitive, purportedly universal, abstract concepts.<sup>4</sup> Thus the following sentences, for example:

(5) The train traveled from New York to New Jersey

(6) Harry gave the book to the library

are considered to involve an underlying abstract concept corresponding somehow to "moving" or "going".

Larson (1988: 174) extends this notion and tries to give it a more realistic ground by affording it a place in the realistic domain of Situation Semantics. He proposes to regard these abstract predicates as uniformities across situations, like individuals and relations. He thus hypothesizes that each of the two example sentences above (or rather the utterances thereof) involves an event-type whose principle relation is the uniformity that can be represented as follows:

$$GO(x, y, z)$$

This is a three-place relation in which the first argument somehow "moves" from the second argument to the third.

Those event-types that have this relation  $GO(x, y, z)$  as its principle relation are called by Larson *thematic situation types*. They typically have the following form:

(7)  $E_{GO} :=$  at  $l$ :  $GO$ ,  $b$ ,  $E_1, E_2$ ; yes

Notice that this is a complex event-type that may itself contain other event-types as well.

Now the intuitive observation of the systematic correspondence between utterances of sentences containing verbs of “moving” and the intuitively perceived abstract concepts can be more rigorously characterized as constraints in Situation Semantics; Those sentences that are observed to have the underlying abstract concept of “moving” are the sentences whose denotations are those event-types that involve the thematic situation type  $E_{GO}$ .

Thus the utterance of the sentence (5) above denotes an event which is of the following event-type:

$$(8) \quad E := \text{at } l: \text{ travel, } b; \text{ yes}$$

This event-type in turn involves an event-type that has the thematic situation type (7). Namely there is a constraint of the form:

$$(9) \quad C: \text{ at } l_u: \text{ involves, } E, E_{GO}; \text{ yes,}$$

where the latter  $E_{GO}$  further breaks down to:

$$\begin{aligned} E_{GO} &:= \text{at } l: \text{ GO, } b, E_1, E_2; \text{ yes} \\ E_1 &:= \text{at } l_1: \text{ present, } b; \text{ yes} \\ E_2 &:= \text{at } l_2: \text{ present, } b; \text{ yes} \\ l_1 &< l_2, l \circ l_1, l \circ l_2 \end{aligned}$$

The latter event-type says, intuitively, that to travel is to change the locations where one is in. The relation  $<$  is the precedence over space-time locations, while  $\circ$  is the overlapping over them.

## 2.5 Roles

In natural language semantics, it is important to distinguish among the *roles* played by individuals in events. For the characterization of the Japanese post-nominal particles, it is crucial that we have a way to distinguish those roles. In order to take care of these, it is good to have a special kind of indeterminates that are anchored to those individuals in such events as ascribe certain properties to them. This can be done by *complex indeterminates* (Barwise and Perry 1983:78-80). Thus we need, in addition to the previously introduced basic indeterminates, those indeterminates that characterize roles in events. So the definition of indeterminates must consist of the following two clauses:

1. Every basic indeterminate is an indeterminate;
2. If  $x$  is an indeterminate and  $E(x...)$  is an event type then  $\langle x, E \rangle$  is an indeterminate.

We call the latter kind of indeterminates *roles* (Barwise and Perry 1983:80).

The definition of anchoring must be extended accordingly:

1. for every basic individual, location or relation indeterminate  $x$  in the domain of  $f$ ,  $f(x)$  is an individual, location or relation, respectively.
2. for every role  $r = \langle y, E \rangle$  in the domain of  $f$ ,  $f$  is an anchor for each indeterminate in  $E$  and  $f(r) = f(y)$ .

Clearly, with the apparatus introduced so far, we can define the traditional concept of *thematic role*. Consider a thematic situation type  $E_{GO}$ :

$E_{GO} :=$  at  $l$ : GO,  $b$ ,  $E_1$ ,  $E_2$ ; yes

$E_1 :=$  at  $l_1 \dots$

$E_2 :=$  at  $l_2 \dots$

where  $E_1$  and  $E_2$  are event-types possibly containing indeterminates other than  $b$ . Intuitively speaking  $b$  is what "goes" from  $E_1$  to  $E_2$ . We could call such a  $b$  the theme of this thematic situation type.

$E_1$  is the event-type from which  $b$  "goes". But we cannot define the source of  $E_{GO}$  just as  $E_1$  because  $E_1$  could be any event-type. We would want to define the source of an event-type in such a way that the semantics of donatory verbs and post-nominal particles can be specifically characterized by it. Then the source of  $E_{GO}$  is to be defined as:<sup>5</sup>

**SOURCE** =  $\langle so, E_{GO} \rangle$ ,

where:

$$so = \begin{cases} \langle a, E_1 \rangle & \text{if } E_1 \text{ is complex relation } E_1(a, l, \dots), \text{ or} \\ \langle l_1, E_1 \rangle & \text{if } E_1(l_1) \text{ does not contain such an } a. \end{cases}$$

Informally the source of thematic situation type  $E_{GO}$  is a complex indeterminate  $\langle so, E_{GO} \rangle$  whose first coordinate itself is either another complex indeterminate  $\langle a, E_1 \rangle$ , where  $a$  is a constituent of the event-type  $E_1$ , or  $\langle l_1, E_1 \rangle$ . Suppose  $f$  is an anchor such that **SOURCE** =  $\langle so, E_{GO} \rangle$  is in its domain. Then, from the inductive definition of indeterminates and anchoring,  $f$  is an anchor for each indeterminate in  $E_{GO}$  and hence  $f(\text{SOURCE}) = f(so)$ , which in turn means that, since  $so = \langle a, E_1 \rangle$  is also in the domain of  $f$  and  $f$  is an anchor for each indeterminate in  $E_1$ ,  $f(so) = f(a)$ .

In the similar vein, the goal of  $E_{GO}$  can be defined as:

**GOAL** =  $\langle gl, E_{GO} \rangle$ ,

where:

$$gl = \begin{cases} \langle c, E_2 \rangle & \text{if } E_2 \text{ is complex relation } E_2(c, l, \dots), \text{ or} \\ \langle l_2, E_2 \rangle & \text{if } E_2(l_2) \text{ does not contain such a } c. \end{cases}$$

We use, in the next section, the notions introduced in this section to analyze our fragment.

### 3 Japanese Donatory Verbs and Post-nominal Particles

From the discussion above it is clear that the Japanese donatory verbs should be understood as denoting event(-type)s that are constrained to involve thematic situation types similar to  $E_{GO}$ .

Let us consider first the verb *youtu*, which means “to give”. Our situation semantic consideration makes it evident that the utterance containing this verb should denote an event which is of the event-type:

$$(10) \quad E_{youtu} := \text{at } l: \text{youtu}, a, b, c; \text{yes}$$

There is in our theory a constraint of the form:

$$(11) \quad C: \text{at } l_u: \text{involves}, E_{youtu}, E_{GO}; \text{yes},$$

where:

$$\begin{aligned} E_{GO} &:= \text{at } l: GO, b, E_1, E_2; \text{yes} \\ E_1 &:= \text{at } l_1: \text{possess}, a, b; \text{yes} \\ E_2 &:= \text{at } l_2: \text{possess}, c, b; \text{yes} \\ l_1 &< l_2, l \circ l_1, l \circ l_2 \end{aligned}$$

$E_{GO}$  is a thematic situation type in which *a* possesses *b* at  $l_1$  while it is *c* that possesses *b* at  $l_2$ . To understand the intuition behind this characterization, suppose that *e* is a specific event in which Hanako gives a letter to Taro. Namely:

$$(12) \quad e := \text{at } l: \text{youtu}, \text{hanako}, \text{letter}, \text{taro}; \text{yes}$$

Then by (11), there is a meaningful option  $e'$  from *e* with respect to *C* above ( $e \Rightarrow_C e'$ ), such that:

$$\begin{aligned} e' &:= \text{at } l: GO, \text{letter}, e_1, e_2; \text{yes} \\ e_1 &:= \text{at } l_1: \text{possess}, \text{hanako}, \text{letter}; \text{yes} \\ e_2 &:= \text{at } l_2: \text{possess}, \text{taro}, \text{letter}; \text{yes} \\ l_1 &< l_2, l \circ l_1, l \circ l_2 \end{aligned}$$

This is a situation of type  $E_{GO}$  in which Hanako possesses a letter at a certain portion of the time in which her giving takes place, while, at another portion of the giving-event that follows Hanako’s possession, it is Taro that possesses the letter.

Suppose that in  $E_{youtu}$  an anchor *f* anchors *a* to “hanako”, *b* to “letter”, and *c* to “taro”. Then, since  $E_{youtu}[f]$  is part of *e*,  $e : E_{youtu}$ . By the definition of “meaningful option” and the fact that  $e \Rightarrow_C e'$ , it is guaranteed that  $e'$  is of type  $E_{GO}$  by *f*. Moreover, by the definition of **SOURCE**,  $f(\text{SOURCE}) = f(\text{so}) = f(a) = \text{hanako}$ . Turning now to the goal of the *youtu*-event, we see that *f* assigns,



by definition,  $f(\text{GOAL}) = f(g1) = f(c) = \text{taro}$ . This is an intuitively sound result. Thus, following the definitions of **SOURCE** and meaningful option, we know that, when a sentence is uttered whose denotation is the situation  $e$  above, the person referred to by the name Hanako is the source of the giving-event, the “giver” of  $e$ . Similarly, the goal of the event  $e$ , the “givee”, is seen to be anchored to Taro.

As an another example of a donatory verb, we turn to *morau*, “to receive”. An utterance of a sentence containing this verb involves an event-type of the following structure:

$$(13) \quad E_{\text{morau}} := \text{at } l: \text{ morau, a, b, c; yes}$$

This event-type further involves another thematic situation type by the following constraint:

$$(14) \quad C: \text{ at } l_u: \text{ involves, } E_{\text{morau}}, E'_{GO}; \text{ yes,}$$

where:

$$\begin{aligned} E'_{GO} &:= \text{at } l: \text{ GO, b, } E_1, E_2; \text{ yes} \\ E_1 &:= \text{at } l_1: \text{ possess, c, b; yes} \\ E_2 &:= \text{at } l_2: \text{ possess, a, b; yes} \\ l_1 &\prec l_2, l \circ l_1, l \circ l_2 \end{aligned}$$

Notice that event-type  $E_1$  here is the same as the  $E_2$ , and  $E_2$   $E_1$ , in the event-type  $E_{GO}$  involved by  $E_{\text{yaru}}$ . Since the individual, if there is one, in  $E_1$  is anchored to the **SOURCE** of the whole thematic situation type, in  $E_{GO}$  above it is  $c$  that is the source. In other words, the two thematic situation types  $E_{GO}$  and  $E'_{GO}$  have exactly the same structure.

To see this point more clearly, suppose an utterance is made which involves the event:

$$(15) \quad e'' := \text{at } l': \text{ morau, taro, letter, hanako; yes}$$

This event is of type  $E_{\text{morau}}$  by an anchor  $g$  such that  $g(a) = \text{“taro”}$ ,  $g(b) = \text{“letter”}$ , and  $g(c) = \text{“hanako”}$ , i.e.  $E_{\text{morau}}[g]$  is part of  $e''$ . By (14), there is an event  $e'''$  with  $e'' \Rightarrow_C e'''$  such that

$$\begin{aligned} e''' &:= \text{at } l: \text{ GO, letter, } e_3, e_4; \text{ yes} \\ e_3 &:= \text{at } l_3: \text{ possess, hanako, letter; yes} \\ e_4 &:= \text{at } l_4: \text{ possess, taro, letter; yes} \\ l_3 &\prec l_4, l' \circ l_3, l' \circ l_4 \end{aligned}$$

By the definition of **SOURCE**,  $g(\text{SOURCE}) = g(\text{so}) = \text{“hanako”}$ . Notice that, if  $f(l) = g(l')$ ,  $f(l_1) = g(l_3)$ , and  $f(l_2) = g(l_4)$ ,<sup>6</sup> then  $e_3$  is the same as  $e_1$  and  $e_4$  is the same as  $e_2$ . So  $e'''$  is actually the same event as  $e'$ . This shows

that  $E_{GO}[f]$  is the same event type as  $E'_{GO}[g]$ . Moreover, even though  $f \neq g$ ,  $f(\text{SOURCE})$  with respect to the event  $e$  is the same as  $g(\text{SOURCE})$  with respect to  $e'$ : “hanako”. In other words,  $e$  and  $e''$  both imply the same event (type):  $E_{GO}[f] = E'_{GO}[g] = e'' = e'''$ . The latter event type is what is supposed to underlie the *giving*-situation: the common “giving” structure. The difference between  $e$  and  $e''$  lies in the way they are related to the this common event-type.

### 3.1 post-nominal particles defined

This fact is an important step toward the characterization of the semantics of the post-nominal particles, such as *-ni* and *-kara*, for one of the functions of those particles is exactly to mark the roles that the individuals denoted by the nouns play in a situation. More specifically *-ni* means that, among other things, the noun to which it is attached is the goal of the event whose existence is involved by the utterance of the sentence. The noun, on the other hand, to which *-kara* is attached is the source of such an event. The denotation of *-ni*, therefore, is what obtains between an event and an individual only when the latter is the goal of the former. Thus the denotation of the post-nominal particle *-ni* can be defined as a relation which holds between an individual and an event if and only if the individual is certainly the goal of the event.

We can make this more precise by giving it a formal definition. Let us represent the denotation of an expression by enclosing the expression in  $\| \cdot \|$ . So the denotation of *-ni* is  $\|ni\|$ . From the above discussion, it is clear that, given the constraint (11) and anchor  $f$ , the relation  $\|ni\|$  certainly holds between *taro* and  $e$  above; *taro* is certainly assigned to the goal of  $e$  by  $f$ . But before defining the relation  $\|ni\|$ , we have to ponder a little more over the concept of goal and source.

Suppose that  $C: \text{at } l_u: \text{involves}, E_0, E_{GO}; \text{yes}$  is a constraint. Given an utterance that involves an event of type  $E_0$ , **SOURCE** is defined with respect to some  $e'$  such that  $e \Rightarrow_C e'$  and hence  $e' : E_{GO}$ , not with respect to  $e$  *per se*. Intuitively speaking, however, as we have seen above, we would want to speak of the source of  $e$  or even of the utterance that corresponds to  $e$ , not the source of some  $e'$ . Nonetheless, we need not be overly concerned, for when  $e'$  is a meaningful option of  $e$  with respect to the constraint  $C$ ,  $e \Rightarrow_C e'$ , then, by definition, for any anchor  $f$ ,  $e : E_0[f]$  implies  $e' : E_{GO}[f]$ . The implication does not go the other way. Consider, for example, the thematic situation type:

$$\begin{aligned} E_{GO} &:= \text{at } l: \text{GO}, b, E_1, E_2; \text{yes} \\ E_1 &:= \text{at } l_1 \dots \\ E_2 &:= \text{at } l_2 \dots \end{aligned}$$

Suppose that  $f(l_1)$  is defined but  $l_1$  does not appear in  $E_0$ . Suppose furthermore that  $E_1$  does not contain indeterminates other than  $l_1$ . Then by the definition of **SOURCE**,  $f(\text{SOURCE}) = t$ , for some space-time location  $t$ . We can easily think of an  $f$  such that  $E_0[f]$  is not part of  $e$ ; the space-time location of  $e$ , say  $t'$

can be different from  $t$ . Even so, we can loosely speak of the source of  $e$ , instead of the source of  $e'$ ; what is anchored by  $f$  in  $e'$  is at least what is compatible with  $e$ . Thus, if  $f$  assigns  $d$  to the source of  $e' : E_{GO}[f]$ , i.e.,  $f(\text{SOURCE}) = d$ , then, thanks to the meaningful option relation  $e \Rightarrow_C e'$ , we can say that  $d$  is the source of  $e$ . So we can write  $\text{SOURCE}(e)_f$  and say “the source of  $e$ ”, rather than  $f(\text{SOURCE})$  of  $e'$ .

The intuition that *-ni* means that the noun to which it is attached is the goal of the event whose existence is involved by the utterance of the sentence can be rephrased as: given an anchor  $f$ ,  $\text{taro}$  and  $e$  satisfy the relation  $\llbracket ni \rrbracket$  iff  $\text{taro}$  is  $\text{GOAL}(e)_f$ . This in turn means, more precisely, that  $\llbracket ni \rrbracket(\text{taro}, e)$  iff there is an event  $e'$  by way of the constraint (11) such  $e \Rightarrow_{C_{GO}} e'$  and  $\text{taro} = f(\text{GOAL})$  in  $e'$ .

Now the official definition is easy; we only have to generalize this characterization. To wit: given anchor  $f$ , for any individual  $z$  and event  $e$ ,

- (16)  $\llbracket ni \rrbracket(z, e)$  iff there is a constraint  $C_{GO}$  such that  $e \Rightarrow_{C_{GO}} e'$  and  $z = f(\text{GOAL})$  in  $e'$ , and we denote the latter  $z$  as  $\text{GOAL}(e)_f$ .

In a similar manner, we can define the semantics of *kara*:

- (17)  $\llbracket kara \rrbracket(z, e)$  iff there is a constraint  $C_{GO}$  such that  $e \Rightarrow_{C_{GO}} e'$ , and  $z = f(\text{SOURCE})$  in  $e'$ , and we denote the latter  $z$  as  $\text{SOURCE}(e)_f$ .

### 3.2 Analysis of the Fragment

Using the definitions above, we can characterize the semantics of the Japanese donatory verbs. Before doing so, we can state how our situation theoretic objects are to be associated with (utterances of) sentences. With a view to treating our small fragment presented at the outset, we need the following rules of translation:<sup>7</sup>

1.  $\llbracket [N]A \rrbracket(z)$  iff  $f(\llbracket A \rrbracket) = z$ .
2.  $\llbracket [P]N-P \rrbracket(X, e)$  iff for some  $z \in e$ ,  $X = \{e : \llbracket P \rrbracket(z, e) \text{ and } \llbracket N \rrbracket(z)\}$ .
3.  $\llbracket [V]P PP VP \rrbracket(z, e)$  iff  $\llbracket VP \rrbracket(z, e)$ ,  $e \in X$ , and  $\llbracket PP \rrbracket(X, e)$ .

Let us see now how our theory so far can handle our problem at hand. Consider again the following sentences, which are repeated here for convenience:

- (18) **Hanako-ga Taro-ni tegami-wo yat-ta**  
 hanako-SUBJ taro- to letter-OBJ give-PAST  
 Hanako gave Taro a letter
- (19) **Taro-ga Hanako-kara tegami-wo morat-ta**  
 taro-SUBJ hanako- from letter-OBJ be given-PAST  
 Taro received a letter from Hanako

With a standard syntactic procedure the first sentence (18) can be given the following syntactic structure:

$$[_s[_{PP}\text{Hanako-ga}][_{VP}[_{PP}\text{Taro-ni}][_{VP}[_{PP}\text{tegami-wo}][_yat-ta]]]]$$

Following this syntactic structure, we can apply the translation rules defined above, constituent by constituent. First the nouns *Taro*, *Hanako*, and *tegami* are given, with some anchor  $f$ , the following conditions:

$$\|[_N\text{Taro}]\|(z) \text{ iff } f(\|[_N\text{Taro}]\|) = z = \text{taro}$$

$$\|[_N\text{Hanako}]\|(x) \text{ iff } f(\|[_N\text{Hanako}]\|) = x = \text{hanako}$$

$$\|[_N\text{tegami}]\|(w) \text{ iff } f(\|[_N\text{tegami}]\|) = w = \text{letter}$$

The condition for the post-nominal phrase *Taro-ni* is given as follows:<sup>8</sup>

$$\|[_{PP}\text{Taro ni}]\|(X, e) \text{ iff there exists some } z \in e, X = \{e : \|[_N\text{ni}]\|(z, e) \text{ and } \|[_N\text{Taro}]\|(z)\}.$$

We see that  $X$  is a set of those events that stand in  $\|[_N\text{ni}]\|$ -relation with some individual in  $e$  and that individual is the denotation of the (utterance of) noun *taro*. We know in turn, from the definition of  $\|[_N\text{ni}]\|$  that  $\|[_N\text{ni}]\|(e, z)$  iff there is a meaningful option  $e'$  such that  $e \Rightarrow_{C_{GO}} e'$  and  $f(\text{GOAL}) = z$  in  $e'$ ; i.e.,  $z = \text{GOAL}(e)_f$ . All in all,  $X$  is the set of those events that involve thematic situation types that have taro, who is also in  $e$ , as goal. And then the verb phrase *Taro-ni yatta* is translated as:

$$\|[_{VP}\text{Taro-ni yat-ta}]\|(z, e)$$

this relation is satisfied iff  $e \in X$ ,  $\|[_{VP}\text{Taro-ni}]\|(X, e)$ , and  $\|[_{VP}\text{yatta}]\|(z, e)$ ; if  $e$  is a *yaru*-event in which taro is the goal<sup>9</sup>.

In sum, the utterance of the sentence (18) involves the following event type:

$$\begin{aligned} \text{in } e &:= \text{at } l: \text{yaru, hanako, letter, taro; yes} \\ &\quad \text{agt, hanako; yes} \\ &\quad \text{ptnt, letter; yes} \end{aligned}$$

which, by the constraint (11), involves the thematic situation:

$$\begin{aligned} \text{in } e' &:= \text{at } l: \text{GO, letter, } E_1, E_2; \text{ yes} \\ E_1 &:= \text{at } l_1: \text{possess, hanako, letter; yes} \\ E_2 &:= \text{at } l_2: \text{possess, taro, letter; yes} \\ l_1 &< l_2, l \circ l_1, l \circ l_2 \end{aligned}$$

This  $e'$  is an event of type  $E_{GO}$ , for  $e' = E_{GO}[f]$ , where  $f(a) = \text{hanako}$ ,  $f(b) = \text{letter}$ , and  $f(c) = \text{taro}$ . Since  $f(\text{GOAL}) = f(c)$ , taro is the goal in  $E_{GO}$ , and hence in  $e'$ ; a fact preserved through the characterization of *-ni*.

Sentence (19) can be analyzed in the similar manner, giving the following as the final product:

in  $e'' :=$  at  $l$ : morau, taro, letter, hanako; yes  
 agt, taro; yes  
 ptnt, letter; yes

By the constraint (14) this in turn involves the following:

in  $e' :=$  at  $l$ : GO, letter,  $E_1$ ,  $E_2$ ; yes  
 $E_1 :=$  at  $l_1$ : possess, hanako, letter; yes  
 $E_2 :=$  at  $l_2$ : possess, taro, letter; yes  
 $l_1 \prec l_2, l \circ l_1, l \circ l_2$

Given the same anchor  $f$  as above, this again is  $E_{GO}[f]$ , and we see that  $f(\text{SOURCE})=f(a)=\text{hanako}$ .

There are a few things to be noticed here. First of all although *Hanako* is eventually anchored to the source of the inferred event  $e'$ , *Hanako* is not marked with *-kara* in sentence (18). Similarly in sentence (19), although *Taro* is eventually anchored to the goal of the inferred event  $e'$ , *Taro* is not marked with *-ni*. This point suggests that what is already marked as the agent of an event is not marked any other way. The agent-marked *Hanako-ga* rules out the agent-source-marked *\*Hanako-ga-kara*, and *Taro-ga* similarly rules out *\*Taro-ga-ni*. This may be explained in connection with the fact that the agent and the patient are defined in terms of the event denoted by the uttered sentence, not, as the source and the goal are, in terms of the inferred event.

Secondly, notice that the same situation  $e'$  is involved by both  $e$  and  $e''$ ; As far as the thematic roles are concerned, sentences (18) and (19) imply exactly the same situation. This point was already discussed at the end of the last section.

### 3.3 point of view

The second point above seems to suggest that we could even conjecture that donatory verbs are those verbs that are constrained to involve this  $E_{GO}$ . This contention is made stronger when we consider the last sentence in our fragment.

- (20) **Hanako-ga Taro-ni tegami-wo kureta**  
 Hanako-SUBJ Taro- to letter-OBJ give-PAST  
 Hanako gave (our) Taro a letter

Notice that the translation of (20) is "Hanako gave *our* Taro a letter". I put the awkward pronoun "our" in order to convey the sense of indexicality in this sentence: Taro is somehow "related" to the speaker of (20). This relation between the speaker and the denotation of Taro may be ambiguous: Taro is a member of Hanako's family, is a close friend of hers, etc. It is in general what holds between the speaker and Taro if the former feels (emotionally) attached to or associated with the latter. We can say that the speaker's (emotional) "point

of view" is on Taro. The speaker is referring to the event as if Taro is part of her/his own point of view. We represent this fact as: "pov, u, taro; yes."<sup>10</sup>

So the sentence (20) denotes the following event:

in  $e :=$  at  $l$ : kureru, hanako, letter, taro; yes  
 agt, hanako; yes  
 ptnt, letter; yes  
 pov, u, taro; yes

Since this is a donatory verb it naturally involves the thematic situation type  $E_{GO}$ , by the following constraint:

(21)  $C$ : at  $l_u$ : involves,  $E_{kureru}(a, b, c)$ ,  $E_{GO}(a, b, c)$ ; yes,

where

in  $e''' :=$  at  $l$ : GO, letter,  $E'_1$ ,  $E'_2$ ; yes  
 $E'_1 :=$  at  $l'_1$ : possess, hanako, letter; yes  
 $E'_2 :=$  at  $l'_2$ : possess, taro, letter; yes  
 $l'_1 \prec l'_2, l \circ l'_1, l \circ l'_2$

Notice again that this  $e'''$  is the same as the thematic situation type that is implied by both (18) and (19). All of the three verbs considered in this paper, *yaru*, *morau*, *kureru*, involve, when interpreted as event-types, the thematic situation type  $E_{GO}$ .

### 3.4 general constraint of donatory verbs

The discussion so far suggests that we may characterize the semantics of the donatory verb in a general fashion. Given a donatory verb  $\phi$ , we can give its interpretation,  $\|\phi\|$ , as the event type,  $E(a, b, c, l)$  such that

$E :=$  at  $l$ :  $\phi'$ ,  $\{a, b, c\}$ ; yes

...

where  $\{a, b, c\}$  is a temporary meta-theoretical notation to indicate that the order of these indeterminates are not important, and there is a constraint, which we label  $C_{DON}$ , such that:

(22)  $C_{DON}$ : at  $l_u$ : involves,  $E(a, b, c, l)$ ,  $E_{GO}(a, b, c, l)$ ; yes,

where:

$E_{GO} :=$  at  $l$ : GO, b,  $E_1$ ,  $E_2$ ; yes  
 $E_1 :=$  at  $l_1$ : possess, a, b; yes  
 $E_2 :=$  at  $l_2$ : possess, c, b; yes  
 $l_1 \prec l_2, l \circ l_1, l \circ l_2$

The semantic and informational differences among the donatory verbs that are pertinent can be thought of as issuing from the particular ways in which the content of  $E$  for each of these verbs is arranged. This can readily be read off from our analysis above. For example, *yaru* differs from *morau* in that it assigns the agent of *yaru*-event to its source while the latter assigns the agent of *morau*-event to its goal role. The difference between *yaru* and *kureru*, on the other hand, is how the speaker's point of view is extended to the event described.

## 4 Conclusion

We have developed a theory for the semantics of the Japanese donatory verbs and for the characterization of some post-nominal particles within the framework of Situation Semantics. We have shown that our characterization in which the semantics of the donatory verbs essentially involves a thematic situation type gives us a nice way to capture the generalization underlying these verbs.

As a corollary to our analysis, it has been noted that the donatory verbs have a general constraint upon their implied event types; the so-called common underlying form. It then follows, as we have seen, that the differences among the individual verbs result from the differences in the way the described situation of each verb(-meaning) is related to this general constraint. The point of view on the described situation, for example, has been noted specifically to give rise to two different verb meanings. It can be observed, thus, that our analysis here accounts for the intuitive, hitherto non-formal, observation of the abstract concept underlying donatory verbs and post-nominal particles.

## Notes

<sup>1</sup>In the following discussion, a situation and an event are used interchangeably.

<sup>2</sup>The relation "is part of" is the relation that obtains between  $e_0$  and  $e_1$  if, roughly,  $e_0$  and  $e_1$  have the same locations and everything happening in  $e_0$  is also happening in  $e_1$ .

<sup>3</sup>This notation is mine, not due to Barwise and Perry's.

<sup>4</sup>For the discussion of and motivation for such an approach to lexical meaning within the framework of the more conventional Montague semantics, the reader is referred to Dowty 1979.

<sup>5</sup>The definitions are essentially the same as (Larson 1988:179), with some minor changes.

<sup>6</sup>Actually this is what we would want to have. If the (utterance describing) event (15) is describing the same situation as (12) then it seems mandatory that  $f(l_1) = g(l_3)$  and  $f(l_2) = g(l_4)$ .

<sup>7</sup>I use the conventional abbreviations for grammatical categories. Hence N stands for noun, P for post-nominal particle, PP for post-nominal phrase, etc.

<sup>8</sup>We simply assume the other post-nominal particles *-ga* and *-wo* are translated as **agent** (agt) and **patient** (ptnt), respectively.

<sup>9</sup>I do not explicitly treat the tense-aspect marker *-ta* in this paper.

<sup>10</sup>I do not use this relation "pov" in a strict sense. The theory of point of view and perspectivity is an important issue in itself, and the topic is well beyond the scope of this paper. See Katagiri 1989 for more on a theory of perspectivity.

## References

- [1] Barwise, Jon, and John Perry. *Situations and Attitudes*. Cambridge, Mass:MIT, 1983.
- [2] Dowty, David. *Word Meaning and Montague Grammar*. Dordrecht:Reidel, 1979.
- [3] Jackendoff, Ray. *Semantics and Cognition*. Cambridge, Mass:MIT, 1983.
- [4] Gruber J. *Studies in Lexical Relations*, unpublished Ph.D. dissertation. Cambridge, Mass: MIT, 1965.
- [5] Katagiri, Yasuhiro. "Semantics of Perspectival Utterances," *Proceedings of the 11th International Joint Conference on Artificial Intelligence*, pp. 1474-79. Morgan Kaufmann, 1989.
- [6] Larson, Richard "Implicit Arguments in Situation Semantics". *Linguistics and Philosophy*, 11 (1988) 169-201.